

**INFLUENCE OF HOST PLANT ON FECUNDITY OF
ALEUROCANTHUS WOGLUMI ASHBY
(HOMOPTERA: ALEYRODIDAE)**

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Abstract.—The ovaries of citrus blackfly females are nonfunctional at eclosion but become functional within 24–36 h thereafter. Egg development is synchronous and monotene, with all available eggs deposited in each egg spiral. Maximum number of eggs laid was 118. There were significant differences in the fecundity of females reared on different host plants with the greatest from *Citrus* spp. and the least from *Eriobotya japonica* Lindley. Variation in fecundity is due to host plant and not to differences in female survival or the percentage of females laying eggs. Fecundity is significantly correlated with nymphal survival among the host plants indicating that both are influenced by the same host plant factors.

Key Words.—Insecta, Aleyrodidae, *Aleurocanthus woglumi*, fecundity, hostplant, *Citrus*

Citrus blackfly (CBF), *Aleurocanthus woglumi* Ashby, is an aleyrodid of Asian origin that is currently found in Florida, Texas and Mexico. Female CBF deposit eggs in spirals on the underside of leaves, most notably on *Citrus* spp. (Dietz & Zetek 1920). The host plant influences the number of eggs deposited on it and the subsequent survival of nymphs. Oviposition is influenced by the levels of foliar nitrogen, sugars, cysteine and methionine (RVD, unpublished data) but nymphal survival is affected by the density of living tissue and the presence of allelochemicals (Dowell 1989, Dowell & Steinberg in press).

This study determined whether host plants of CBF nymphs influenced their subsequent fecundity, and how ovary and oocyte maturation patterns influence egg deposition.

MATERIALS AND METHODS

Females were taken from potted citrus trees 4 h ($n = 12$) or 24–36 h ($n = 6$) after eclosion and dissected to determine the condition of their ovaries. Females reared on *Citrus* spp. were dissected after depositing an egg spiral to determine whether any eggs were left in the ovaries or oviducts.

Six species of plants (Table 2) were exposed to CBF infested citrus trees in October, 1980. The plants then were held in a screenroom until adult CBF began to emerge. After emergence, single females were removed from the plant upon which they developed and placed in a 30 dram vial with a *Citrus × paradisi* Macfadyen leaf and one or two males. The vials were held at 24–27° C under artificial light (16 h photophase) until the female died; she was dissected and the number of eggs was noted. The leaf was then removed and the egg spirals and eggs were counted. The leaf petiole was held in water until egg hatch to determine fertility.

Longevity and fecundity data were transformed to $\log_{10}(x + 1)$ prior to Analysis of Variance. Transformed means were separated using Duncan's Multiple Range

Table 1. Relationship between number of egg spirals and average fecundity and age of females at death.

Number of spirals	Average number eggs per female (n) ^a	Average age of female at death (days) ^b	Average increase in number eggs per female
0	0	2.5 ± 1.0 [a]	—
1	37.7 ± 9.7 (37) [a]	3.3 ± 1.0 [a]	37.7
2	55.8 ± 8.5 (11) [b]	7.4 ± 2.1 [b]	18.1
3	67.0 ± 24.1 (4) [c]	9.0 ± 1.0 [c]	11.2
4+ ^c	94.5 ± 33.2 (2) [d]	9.0 ± 0 [c]	8.8

^a Mean ± SD, with means followed by different letters [a] differing at $P < 0.05$. ANOVA values $F = 15.99$; $df = 3, 51$; $P < 0.01$.

^b As a: ANOVA values $F = 26.42$; $df = 3, 67$; $P < 0.01$.

^c Includes females laying 4 and 5 egg spirals.

Test (Little & Hills 1978). The relationship between host plant specific fecundity and 34 chemical and physical attributes of the host plants (RVD, unpublished data) or nymphal survival (Dowell & Steinberg in press) was determined using regression analysis (Little & Hills 1978).

RESULTS AND DISCUSSION

The ovaries of CBF are not functional at eclosion but elongate within 24–36 h so that oocytes are visible. Oocyte development is synchronous and generally monotene with a single oocyte developing in each ovariole. Each egg spiral consists of all available mature eggs; no eggs were found in the ovaries or oviducts of females that had just deposited an egg spiral. Both the number of eggs laid per female and the age of the females at death significantly increase with the number of egg spirals laid. In contrast, the average increase in the number of eggs laid per female decreases with age (Table 1) indicating that fewer ovarioles produce eggs as the female ages.

The greatest number of eggs laid was 118 by a female reared on *Citrus* spp. (Table 2). The greatest longevity was 17 days. The average number of eggs per spiral from *Citrus* spp. females was 31.5 (Table 2). These data agree closely with previous studies where females laid 20–40 eggs per spiral and egg laying began 1–4 days after eclosion (Dietz & Zetek 1920). The data confirm the conjecture of Dietz & Zetek (1920) that females can lay over 100 eggs.

There were significant differences in the fecundity of females from the six test plants; the highest fecundity was on *Citrus* spp. and the lowest on *Eriobotrya japonica* Lindley. There were significant differences in the average number of eggs per spiral among the test plants; females bred on *Ardisia solanacea* Roxburg and *Citrus* spp. laid the largest egg spirals and those from *Eugenia uniflora* L. the smallest. The maximum number of eggs from a female and the percentage of females laying eggs followed the trend of fecundity; the greatest values were for *Citrus* spp. and the lowest for *E. japonica*. There were no significant differences in female longevity ($F = 1.80$, $df = 5$, $P > 0.05$) or in percentage egg hatch ($\chi^2 = 4.77$, $df = 5$, $P > 0.05$) among the test plants (Table 2).

If fecundity was calculated using only those females that laid eggs significant differences were evident among the plants with the highest values on *A. solanacea* (50 ± 22) and *Citrus* spp. (48.4 ± 19) followed by *Mangifera indica* L. ($39.6 \pm$

Table 2. Host plant specific fecundity.

Plant	Average number eggs per female (<i>n</i>) ^a	Average number eggs per spiral (<i>n</i>) ^b	Maximum number eggs	Percentage females laying
<i>Citrus</i> spp.	39.6 ± 25 (44) [a]	31.5 ± 13 (53) [ab]	118	82
<i>Ardisia solanacea</i>	28.6 ± 31 (7) [b]	33.3 ± 11 (6) [a]	82	57
<i>Mangifera indica</i>	17.4 ± 22 (25) [c]	27.3 ± 7 (16) [b]	75	44
<i>Gardenia thunbergi</i> ^c	14.1 ± 20 (13) [d]	26.1 ± 7 (7) [b]	57	38
<i>Eugenia uniflora</i>	10.2 ± 25 (6) [e]	15.0 ± 2 (4) [c]	61	17
<i>Eriobotrya japonica</i>	8.3 ± 11 (12) [f]	19.8 ± 7 (5) [d]	29	14

^a Mean ± SD, with means followed by different letters [a] differing at $P < 0.05$. ANOVA values $F = 5.69$; $df = 5, 102$; $P < 0.01$.

^b As a: ANOVA values $F = 3.44$; $df = 5, 86$; $P < 0.01$.

^c Nymphal survival assumed to be 1.4% for regression analysis.

14), *Gardenia thunbergi* L. (36.6 ± 12) and *E. japonica* (19.8 ± 7) ($F = 6.96$; $df = 4, 57$; $P < 0.01$). The average number of eggs in the ovaries of females that died before ovipositing did not differ from the average number of eggs laid by females ovipositing on *Citrus* spp. (38.0 ± 5.4 versus 48.4 , $t = 1.24$, $df = 28$, $P > 0.05$), on *E. japonica* (18.3 ± 5.6 versus 19.8 , $t = 0.61$, $df = 7$, $P > 0.05$) or on *M. indica* (31.8 ± 5.4 versus 39.6 , $t = 1.62$, $df = 19$, $P > 0.05$). Thus, the differences seen in Table 2 are due to the host plant and not to differences in female longevity or the percentage of females laying eggs. Host plant mediated differences in whitefly fecundity have been reported for *Aleyrodes proletella* (L.) on crucifers (Ihaegwam 1980) and *Trialeurodes vaporariorum* Westwood on an array of glasshouse vegetables (van Boxtel et al. 1978, van Sas et al. 1978).

There were no significant correlations between fecundity and 34 chemical or physical attributes (RVD, unpublished data) of the test plants either singly or in combination ($r < 0.6$, $F < 2.4$, $P > 0.1$). There was a significant correlation between fecundity and the survival of CBF nymphs on plants ($r = 0.95$; $F = 35.6$; $df = 1, 4$; $P = 0.004$) indicating that the same factors that influence survival (believed to be allelochemicals: Dowell 1989, Dowell & Steinberg in press) are affecting the fecundity of the resulting females.

Reduced survival of immature CBF on noncitrus hosts (Dowell & Steinberg in press), combined with reduced fecundity of the resulting females, are primary forces inhibiting the utilization of such hosts by CBF.

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